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Abbreviations and Acronyms

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ASTM	American Society for Testing and Materials
BRA	Basewide Remedial Assessment
BWQAPP	Basewide Quality Assurance Project Plan
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	chain-of-custody
COR	Contracting Officer's Representative
DNAPL	dense nonaqueous phase liquid
DO	dissolved oxygen
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DQE	data quality evaluation
DQO	data quality objectives
EB	equipment blank
EC	electrical conductivity
EPA	U.S. Environmental Protection Agency
EPCF	Environmental Process Control Facility
ERPIMS	Environmental Restoration Program Information Management System
EV	electron voltage
FB	field blank
FD	field duplicate
FID	flame ionization detector
FTL	field team leader
GC/MS	gas chromatography/mass spectrometer
gpm	gallons per minute
HPLC	high performance liquid chromatography
HSP	Health and Safety Plan
ICPES	inductively coupled plasma emission spectroscopy
ID	inside diameter
IDW	investigation-derived waste(s)
IRP	Installation Restoration Program
IS	internal standards
IWCS	industrial wastewater collection system
IWTP	industrial wastewater treatment plant
LCS	laboratory control sample
L/min	liter per minute
LNAPL	light nonaqueous phase liquid
LOC	location
MCL	maximum contaminant level
MDL	method detection limit

MS/MSD	matrix spike/matrix spike duplicate
MEK	methyl ethyl ketone
ML	milliliter
NEIC	National Enforcement Investigation Center
NGVD	national geodetic vertical datum
95 UCL	95-percent upper confidence limit
NIOSH	National Institute for Occupational Safety and Health
NOS	not otherwise specified
NTU	nephelometric turbidity units
ORP	oxidation reduction potential
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
OVM	organic vapor monitor
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, comparability, and completeness
PCB	polychlorinated biphenyl
PCE	perchloroethene or tetrachloroethene
PID	photo-ionization detector
PM	project manager
POL	petroleum, oil, and lubricants
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PQL	practical quantitation limit
QAO	quality assurance objectives
QAPP	Quality Assurance Project Plan
QC	quality control
QCT	quality control tool
QPP	Quality Program Plan
RBP	rapid bioassessment protocols
RCRA	Resource Conservation and Recovery Act
RFI/CMS	RCRA Facility Investigation/Corrective Measures Study
RI/FS	remedial investigation/feasibility study
RME	reasonable maximum exposure
RPD	relative percent difference
RSD	relative standard deviation
SA-ALC	San Antonio Air Logistics Center
SAP	Sampling and Analysis Plan
SCPT	sonic cone penetrometer test or testing
SOP	standard operating procedure
SOW	statement of work
SPLP	synthetic precipitation leaching procedure
STP	sample tracking program
SVOC	semivolatile organic compound
TB	trip blank
TCA	trichloroethane
TCE	trichloroethene

TDS	total dissolved solids
TNRCC	Texas Natural Resource Conservation Commission
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPM	technical project manager
UHP	ultra high purity
USCS	Unified Soil Classification System
UV	ultraviolet
VOC	volatile organic compound

SECTION 1.0

Introduction

In tandem with the attached Sampling and Analysis Plan (SAP), this document constitutes the Basewide Quality Assurance Project Plan (BWQAPP) for Kelly Air Force Base, Texas. The BWQAPP addresses in specific terms, the policies, organization, functions, and specific quality assurance (QA) and quality control (QC) activities associated with environmental data generation for multiple projects at Kelly AFB. This document is designed to be the basis on which project specific Quality Program Plans will be developed. The primary purpose of this document is to meet the CP specified guidelines. Project requirements not located within the CP are also included.

Guidelines followed in preparing this plan are set out in *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations* EPA QA/R-5 (EPA, 1997) and *EPA Guidance for Quality Assurance Project Plans* EPA QA/G-5 (EPA, 1998) and *Quality Assurance Project Plan, Version 3.0* (AFCEE, 1998).

1.1 Project Description

The environmental data collection being performed by various subcontractors at Kelly AFB includes sampling and analysis of: groundwater monitoring wells (including natural attenuation parameters), soils, surface waters, stream sediments, fish tissues , as well as bioassessment sampling of Leon Creek. Individual project-specific work plans will be prepared which will provide a detailed project description as well as field sampling rationale.

1.2 Purpose and Scope

The purpose of this document is to provide QA/QC requirements for sampling activities, and field and laboratory analytical protocols that generate environmental data as part of investigation and remedial activities performed at Kelly AFB.

In preparing the BWQAPP, consideration was given to guidance presented in the AFCEE QAPP Version 3.0 as well as the QAPP prepared for the 1994 and 1998 Kelly AFB Basewide Remedial Assessments (BRA). In order to assure comparability with historic environmental data collected as part of earlier BRAs, the target analyte list for the majority of methods remains unchanged from 1994.

This BWQAPP is an integral component of data quality planning and evaluation for all sampling and analysis activities to be done basewide. A consistent, comprehensive approach for using this BWQAPP is necessary to ensure that a sufficient quantity of data is produced at the necessary quality level to facilitate project decision-making. The scope of the BWQAPP is, therefore, sufficiently broad to accommodate the many small and large tasks, site types, and phases of work on the base.

1.3 Project Organization

Individual project work plans will address the various aspects of the project organization. These work plans will address, at a minimum:

- Individuals/organizations involved in the project
- Roles and responsibilities for all participants
- Organizational relationships and lines of communication among all participants

SECTION 2.0

Quality Program and Data Quality Objectives

Quality objectives are essential to ensuring that data collected are sufficient to meet the intended goals. Quality objectives are pre-established goals or benchmarks used to monitor and assess the progress of the project and the quality of the work performed. It is essential that quality objectives be defined prior to starting project work to ensure that activities performed in support of the project yield data sufficient to meet the project objectives.

Quality objectives are broken into two categories: data quality objectives (DQO) and quality assurance objectives (QAO). DQOs are associated with the overall objective of the project as it relates to data collection. QAOs define the limits of acceptance for the project-generated data as they relate to data quality.

2.1 Data Types

The two categories of data generated as part of the Kelly AFB program are defined as (1) screening and (2) definitive data.

Screening data are generated from rapid analysis methods performed in the field and do not require a formal data package deliverable. Sample preparation, QC, and instrument calibration requirements are much less rigorous than those associated with definitive methods. Screening method may provide analyte identification and quantitation or may be physical measurements such as temperature, pH, or conductivity.

Definitive analytical data are generated using rigorous methods such as those given in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 1996). Definitive methods provide confirmation of both analyte identification and quantitation. These methods may be performed in an onsite or offsite laboratory and have specific QC and documentation requirements.

2.2 Use and Application of the BWQAPP

This BWQAPP is an integral component of data quality planning and evaluation for all sampling and analysis activities at Kelly AFB. A consistent and comprehensive approach for using this BWQAPP is necessary to ensure that sufficient data are produced that are of sufficient quality to enable decisions for all types of sites and phases of work.

In planning for analytical programs, each SAP will have established DQOs. DQOs specify the data type, quality, quantity, and uses needed to make decisions and are the basis for designing data collection activities. One of the goals of the DQO process is to use a QAPP to select the analytical methods needed to achieve the appropriate reporting limits for data use.

Specifying the type, quantity, and quality of data needed for these potential data uses is not feasible within one functional basewide QAPP. However, a BWQAPP does provide the

minimum standards for data quality and required validation. These minimum standards are designed to provide a common baseline for creating comparable data. Each individual activity that generates data might need additional requirements that will be established in the project-specific DQOs and the project SAP.

The guidance for establishing DQOs, as outlined in the EPA's *Guidance for the Data Quality Objectives Process: EPA QA/G-4* (EPA, 1994), will be followed when planning for data collection. Furthermore, each site-specific work plan or SAP will incorporate the seven-step DQO process, as appropriate, using site-specific information as inputs to the DQO process. The work plans and/or SAPs must include acceptable limits for decision errors that will be used to establish appropriate performance goals for the data collection design.

The seven-step DQO process is as follows:

- Step 1: State the problem
- Step 2: Identify the decision
- Step 3: Identify the inputs to the decision
- Step 4: Define the boundaries of the study
- Step 5: Develop a decision rule
- Step 6: Specify acceptable limits on decision errors
- Step 7: Optimize the design

To properly implement the baseline requirements provided in this BWQAPP, project-specific DQOs and SAPs must consider the following factors in addition to those listed above.

2.3 Quality Assurance Objectives

Data are potentially subject to sampling and data reduction errors. QAOs are established to control the sources of errors and quantify the errors whenever possible. QC procedures are designed to both increase sample data quality and help interpret discrepancies in the results. QAOs are quantifiable and qualifiable parameters that are expressed in terms of precision, accuracy, representativeness, comparability, and completeness (collectively referenced as PARCC). The QAOs established in this QAPP will be used for both work plan development and data quality review. The definitions and basis for assessing the PARCC parameters are discussed in the following sections. Formulas for the calculation of statistical measurements associated with a PARCC evaluation are provided in Table 2-1.

TABLE 2-1
Statistical Calculations associated with PARCCs

Statistic	Symbol	Formula	Uses
Mean	$\overline{X}$	$\frac{\left(\sum_{i=1}^{n} x_i\right)}{n}$	Used to determine average value of measurements

Statistic	Symbol	Formula	Uses
Standard Deviation	S	$\left(\frac{\Sigma(x_i-\bar{x})^2}{(n-1)}\right)^{1/2}$	Used in calculating variation of measurements
Relative Standard Deviation	RSD	$(S/\bar{x}) \times 100$	Used to assess precision for replicate results
Percent Difference	%D	$\frac{x_1 - x_2}{x_1} \times 100$	Used to assess accuracy
Relative Percent Difference	RPD	$\left(\frac{(X_1 - X_2)}{(X_1 + X_2)/2}\right) \times 100$	Used to assess total and analytical precision of duplicate measurements
Percent Recovery	%R	$\left(\frac{X_{meas}}{X_{true}}\right) \times 100$	Used to assess accuracy
Percent Recovery	%R	$\frac{\text{value of spiked sample} - \text{value of unspiked sample}}{\text{Value of added spike}} \times 100$	Used to assess matrix effects and total precision

X =Observation (concentration)
n = Number of observations

2.3.1 Precision

Precision may be defined as degree of agreement among measurements resulting from the application of the same process under equivalent conditions. Two types of precision, analytical precision and total precision, may be assessed. Analytical precision is a measure of variability between two duplicate or replicate analyses. Evaluation of laboratory control sample (LCS) recoveries is a measure of analytical precision. Total precision is a measurement of the overall variability of the sampling and analytical process. Analysis of field duplicate or replicate samples is a means to determine total precision. Matrix spike duplicate and field duplicates are analyzed to determine field and analytical precision. Precision for duplicate samples may be calculated by using the relative percent difference (RPD) between duplicate results. For replicate analyses, the relative standard deviation (RSD) may be used as a measurement of precision.

2.3.2 Accuracy

Accuracy is a measure of the agreement between an experimental determination and the true value of the parameter being measured. Analytical accuracy may be measured by comparing LCS recoveries to the established control limits. For organic analyses, surrogate spike recoveries may also be used to assess analytical accuracy. For inorganic analyses, each sample is spiked with a known reference material before digestion. Each approach provides a measure of the matrix effects on the analytical accuracy. Spike recovery is also given as percent recovery (%R).

2.3.3 Representativeness

A qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. Representativeness is a subjective parameter used to evaluate the efficacy of the sampling plan design. Representativeness is demonstrated by providing full descriptions of the sampling techniques and the rationale used for selecting sampling locations in the project scoping documents. Sampling design rationale should be provided in the project-specific SAP.

2.3.4 Completeness

The percentage of measurements that are judged to be valid compared with the total number of measurements made on that analyte. Typically, this calculation is performed for each matrix, method, and analyte combination. The number of valid results divided by the total number of results for that matrix, method, and analyte expresses completeness as a percentage. The Kelly AFB program goal for completeness is 95 percent for aqueous samples and 90 percent for soil/sediment samples by analyte.

$$\% \text{ completeness} = \frac{\text{number of valid (non-R flagged) results}}{\text{total number of reported results}}$$

2.3.5 Comparability

A qualitative measure designed to express the confidence with which one data set may be compared with another. The following factors affect comparability: sample collection and handling techniques, sample matrix type, and analytical method. Comparability is limited by the other parameters because data sets can be compared with confidence only when precision and accuracy are known. Data from one phase of an investigation can be compared to another when the same standard methods are used and data package deliverables are similar.

Selection of Quantitation Limits

The quantitation limits for a specific sampling effort are dictated by the intended use of the data and by guidance provided in Appendix A of the this document. When monitoring to demonstrate progress toward achieving cleanup levels, the quantitation level must be low enough so that the results of the analyses are accurate at the concentration of the cleanup level.

The quantitation levels in this BWQAPP will be used to select appropriate analytical methods for a particular sampling program. The SAP can specify different quantitation limits for a method if the limits are achievable by the method and the limits are suitable for the intended use of the data. The BWQAPP quantitation limits provided in Appendix A will serve in the absence of a requirement provided in a site-specific SAP.

2.4 Elements of Quality Control

This section presents QC requirements relevant to analysis of environmental samples that will be followed during all analytical activities for fixed-base, mobile, and field laboratories

producing definitive data. The purpose of this QC program is to produce data of known quality that satisfy the project objectives and that meet or exceed the requirements of the standard methods of analysis.

Laboratory QC samples (e.g., blanks and laboratory control samples) will be included in the preparation batch with the field samples. An analytical batch is a number of samples (not to exceed 20 environmental samples plus the associated laboratory QC samples) that are similar in composition (matrix) and that are extracted or digested at the same time and with the same lot of reagents. Matrix spikes and matrix spike duplicates count as environmental samples. This analytical batch is a number of samples (not to exceed 20 environmental samples plus the associated laboratory QC samples) that are similar in composition (matrix) and analyzed sequentially. The identity of each analytical batch will be unambiguously reported with the analyses so that a data reviewer can identify the QC samples and the associated environmental samples.

The various types of QC samples and the frequency of use of these samples are discussed below and in the method-specific tables in Appendix A.

2.4.1 Surrogate Spikes

Surrogate spike compounds are added to each sample for the organic analytical methods. For gas chromatography/mass spectrometer (GC/MS) analyses, surrogate spike compounds are the structural homologs of target compounds, often with deuterium substituted for hydrogen, and are therefore expected to behave in a similar manner during analysis. For GC analyses, surrogate spike compounds are structurally similar (but not identical) to target compounds and, again, should behave in a similar manner during analysis. Surrogate spike recoveries for field samples are used to evaluate the potential for matrix interference. When surrogate spike recoveries for field samples fall outside the method target acceptance windows, the samples are re-extracted if appropriate, then re-analyzed. If the surrogate spike recovery is still outside the acceptance window for the re-analyzed sample, the sample results are qualified as affected by matrix interference.

2.4.2 Matrix Spikes/Matrix Spike Duplicates

For this QC measure, three aliquots of a single sample are analyzed: one native and two spiked with the same concentration of matrix spike compounds. Unlike the surrogate spike compounds, matrix spike compounds are found on the method target compound list. Spike recovery is used to evaluate potential matrix interference as well as accuracy. The duplicate spike results are compared to evaluate precision. Matrix spike/matrix spike duplicates (MS/MSD) will be collected a rate of 1 pair per 40 field samples. The components to be spiked into the samples are listed in the method QC tables in Appendix A.

2.4.3 Laboratory Control Samples

An aliquot of ASTM Type II water is spiked with target analytes or compounds at concentrations applicable to the linear calibration range and then prepared and analyzed with a batch of samples. The laboratory control sample is used to demonstrate method performance in that the laboratory is capable of analyzing samples in accordance with the

requirements and to QC the calibration results. The components to be spiked into the samples are listed in the method QC tables in Appendix A.

2.4.4 Internal Standards

Internal standards (IS) are measured amounts of certain compounds added after preparation or extraction of a sample. They are used in an IS calibration method to correct sample results affected by column injection losses, purging losses, or viscosity effects. ISs will be added to environmental samples, controls, and blanks, in accordance with the method requirements.

When the IS results are outside of the acceptance limits, corrective actions will be performed. If diagnostics indicate a matrix effect on internal standard recovery, then reviewer's discretion as to data usability will be used during validation. If the diagnostics indicate a system problem, the after the system problems have been resolved and system control has been re-established, all samples analyzed while the system was malfunctioning will be reanalyzed. If corrective actions are not performed or are ineffective, a reference to that effect will be added to the case narrative.

2.4.5 Method Blanks

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank will be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process. The presence of analytes in a method blank at concentrations equal to or greater than the reporting limit indicates a need for corrective action. Corrective action will be performed to eliminate the source of contamination prior to proceeding with analysis. After the source of contamination has been eliminated, all samples in the analytical batch will be re-prepared and reanalyzed. Blank correction will not be applied to any sample. When an analyte is detected in the method blank and in the associated samples and corrective actions are not performed or are ineffective, a reference to that effect will be included in the case narrative.

2.4.6 Instrument Tuning and Calibration Requirements

Summaries of calibration and GC/MS tuning results will be reviewed for frequency compliance, appropriate sensitivity, resolution, and stability. These summaries determine the stability and application of the calibration to each compound associated with each individual sample.

Field instrument calibration is addressed in the SAP. Laboratory instrument calibration will be checked using all of the analytes listed in the QC acceptance criteria (Appendix A) for the each method. All calibration criteria will satisfy SW-846 requirements at a minimum. The initial calibration will be checked at the frequency specified in the method using materials prepared independently of the calibration standards.

2.4.7 Individual Method Requirements

Each analytical method presents unique QA requirements to assure usability of the data. Examples of these requirements would include serial dilutions for SW-846 Method 6010B

(ICPES) or the pesticide degradation studies for pesticides by GC SW-846 Method 8081A. Each of these unique criteria will be evaluated according to the method requirements.

2.4.8 Trip Blanks

Trip blanks are used to detect contamination by VOCs during sample shipping and handling. Trip blanks are 40-mL VOC vials of organic target-free water that are prepared in the field trailer, transported to the sampling site, and returned to the laboratory with VOC samples. Trip blanks are not opened in the field. One trip blank is to accompany each cooler containing samples that are collected for VOC analysis. Each trip blank is stored at the fixed base laboratory with associated samples and analyzed with those samples. Trip blanks are analyzed for VOCs only.

2.4.9 Equipment Blanks

Equipment blanks (rinsates) are samples of ASTM Type II water passed through and over the surface of decontaminated sampling equipment. They are used to measure the effectiveness of the decontamination process. Equipment blanks are collected as described in the SAP and will reflect the types of equipment and samples taken. If more than one type of equipment is used to obtain samples for a particular matrix, equipment blanks will be collected from each representative group of equipment. For example, if both bailer and pump collect groundwater samples, equipment blanks must be submitted for each piece of equipment. Equipment blanks are analyzed for the same analytes as samples collected that day.

2.4.10 Field Blanks

Field blanks (also referred to as ambient conditions blanks) are samples of the ASTM Type II water used for decontamination and steam cleaning poured at ambient (current) conditions into a sample container at the field site. At a minimum, one sample for each source of water or one field blank per lot number of ASTM Type II water for a given sampling event will be collected for analysis when conditions indicate that ambient conditions could influence quantitation. Examples would include down-wind volatile sampling on an active runway, or analysis of BTEX in an active fueling area. In defining the number of field blanks required, it is important to note that a sampling event is defined as the period beginning when sampling personnel arrive at the installation and ending when personnel leave for more than 24 hours. If more than one lot number of ASTM Type II water is used, additional field blanks must be taken because these constitute different sources.

2.4.11 Field Duplicates/Splits

Field duplicate samples are collected to measure the precision of the sampling process. The field team leader (FTL) will choose at least 5 percent of the total number of sample locations for duplicate sample collection. Duplicate samples will be either a single sample split in the field (surface soil samples) or two separate samples collected sequentially (soil borings). Additional volume will be collected for every second duplicate sample and submitted for the MS/MSD sample.

2.5 Quality Control Procedures

2.5.1 Holding Times

Holding times are specified for each analytical method in Appendix A. The holding time begins at time of collection. For some analytical methods, holding times may be defined for sample preparation as well as sample analysis.

2.5.2 Confirmation

For analyses performed by GC or HPLC, second column confirmation will be required for positive results above the reporting limit unless otherwise specified by the method in Appendix A. The confirmatory analyses must be completed within the method specified holding time. The analytical result associated with the primary column/detector will be the reported result.

2.5.3 Standard Materials, Supplies, and Consumables

Standard materials used in instrument calibration as well as sample preparation must be traceable to National Institute of Standards and Technology (NIST), EPA, American Association of Laboratory Accreditation (A2LA), or other equivalent source, when available. Source expiration dates will be clearly labeled and tracked both in the field and by the fixed-base laboratory.

The laboratory will inspect supplies and consumables prior to use. Inventory and storage of chemicals should be addressed in the Laboratory QAPP. Field supplies and consumables are addressed in the SAP.

SECTION 3.0

Sampling Methodology

3.1 Sampling Process Design

The data collection design for each project should be addressed in detail in the project specific work plan. The data collection design should be presented in sufficient detail to address the following, as appropriate:

- Design of the sampling network
- Types and numbers of samples to be collected
- Sampling locations and frequencies
- Sample matrices
- Measurement parameters of interest
- Sampling design rationale

3.2 Sampling Methods

Individual sampling methods are discussed in detail in the SAP.

3.3 Sample Handling and Custody Requirements

Sampling labeling and packing and shipping/handling issues are addressed in the SAP. Chain-of-custody (COC) forms and sample custody issues are addressed in the following sections.

The possession of samples or other evidence must be traceable from the time samples are collected until they are introduced as evidence in legal proceedings. This documentation will be accomplished through the use of a COC record (Appendix C, SAP). These forms will accompany the sample shipment and will be shipped in the appropriate shipping container (cooler). Copies of the completed COC forms will be included in appropriate data validation packages. Legal field custody will begin when clean sample containers are obtained from the laboratory and will end when those samples are relinquished to the laboratory for testing. This continuity will be reflected by the appropriate entries on the COC form.

According to National Enforcement Investigation Center (NEIC) *Policies and Procedures* (1987), a sample or other physical evidence is said to be under custody if:

- It is in the field investigator's physical possession.
- It is in the field investigator's view, after being in his/her physical possession.
- It was in the field investigator's physical possession and he or she secured it to prevent tampering.
- It is placed in a designated secure area.

3.3.1 Chain-of-Custody Forms

A COC form will be completed prior to sample shipment or release. Information required on the COC forms is specified in Section 5.2 of the AFCEE QAPP as listed below. The form may include information for samples collected by one sampling team or for samples collected by multiple teams. The COC form, sample labels, and field documentation are cross-checked to verify sample identification, type of analysis, number of containers, sample volume, preservatives, collection time, and type of sample container.

Information recorded on the COC form includes:

- Sample identification
- Date and time of collection
- Analytical method(s) requested
- Source of sample (including name, location, and type)
- Sample matrix (e.g., soil or groundwater)
- Preservative (e.g., hydrochloric acid HCl)
- Request for matrix spike analysis or other QC analysis
- Signature blocks for release and acceptance of samples
- Name of collector(s)
- Time blocks for release and acceptance of samples
- Any comments to identify special conditions or requests

An example COC form is shown in Appendix C of the SAP. Suppliers for individual projects may create project-specific COC forms, but they must contain (at a minimum) the information listed above.

3.3.2 Sample Custody during Shipment

Completion of sample custody forms and sample packaging for shipments are performed in the supplier's staging area. Designated field and/or sample control staff will complete and verify COC forms and pack samples for shipment at the end of each sampling day. When shipping or transferring samples, the shipping container(s) will have at least two custody seals affixed. One custody seal will be placed on the front of the container and one on the back in a manner that would indicate if the container had been opened during transit.

If samples are collected for onsite laboratory analysis, the sample control designee or field team member will log in the samples and release them to the onsite laboratory. Sample transfer between supplier staff or between supplier staff and courier, laboratory, etc., will be documented by signing and dating ***Relinquished by*** and ***Received by*** blocks whenever sample possession changes. Samples will be released for shipment by overnight couriers by noting the airbill number on the COC form.

3.3.3 Sample Security

If samples are not shipped on the day of collection, they will be refrigerated or stored on ice in the sample staging area. Security is maintained by having locked supplier facilities in the staging area, a locked security fence surrounding the staging area, and limited access to Kelly AFB.

3.3.4 Sample Shipment and Handling

A completed COC form must accompany all sample shipments. The original COC form will accompany the shipment and a copy of the form will be retained in the project file.

When samples are split for duplicate analysis, a separate COC form will be prepared. The person relinquishing the samples to the facility or agency will request the signature of a representative to acknowledge sample receipt. If a representative is unavailable, a note will be made in the ***Received by*** space. When appropriate, as in the case of overnight shipment, the custody record will contain a statement that the samples were delivered to the designated location and the date and time of delivery noted. Sample collection and shipment will be coordinated to ensure that the receiving laboratory has staff available to process the samples according to method specifications.

3.4 Sample Containers, Volumes and Preservation Requirements

Sample containers for Kelly AFB projects are purchased pre-cleaned and are treated according to EPA specifications for the individual analytical methods. Table 3-1 provides a list of container types, volumes and preservation requirements by method. For methods not addressed in the BWQAPP, container and preservation requirements will be addressed in the project specific FSP.

TABLE 3-1
Requirements for Containers, Preservation Techniques, Sample Volumes, and Holding Times

Name	Analytical Methods	Container[a]	Preservation[b,c]	Minimum Sample Volume or Weight	Maximum Holding Time
Alkalinity	E310.1	P, G	4°C	50 mL	14 days
Common anions	SW9056	P, G	None required	50 mL	28 day SO_4^{-2}; 48 hours for NO_3^- and NO_2^- , $PO4^{-2}$
Cyanide, total and amenable to chlorination	SW9010B SW9012A	P, G, T	4°C; NaOH to pH > 12, 0.6 g ascorbic acid	500 mL or 4 ounces	14 days (water and soil)
Filterable residue	E160.1	P, G	4°C	100 mL	7 days
Hydrogen ion (pH) (W, S)	SW9040B/ SW9045C	P, G	None required	N/A	Analyze immediately
Phosphorous, dissolved	E365.3	P, G	pH<2 H2SO4	250ml	28 days
Phosphorous (orthophosphate)	E365.2	P, G	None	250mL	48 hrs
Hardness	E130.2	P, G	$HNO3_3$ to pH < 2, 4°C	500 mL	180 days

Name	Analytical Methods	Container[a]	Preservation[b,c]	Minimum Sample Volume or Weight	Maximum Holding Time
BOD, 5-day	E405.1	P, G	None	1L	48 hr
COD	E410.4	P, G	pH<2 H2so4	100 mL	28 days
Oil and Grease	E413.1	Amber glass	pH<2 H2so4	1L	28 days
MBAS	E425.1	P, G	None required	1L	48 hrs
TPH	E418.1	Amber glass	pH<2 w/ H_2SO_4	1L	28 days
TPH	TX1005	G, Teflon-lined septum	Sodium bisulfate, l cool at 4°C	40 mL or 8 ounces	7 days water 14 days soil
Conductance	SW9050A	P, G	None required	N/A	Analyze immediately
Temperature	E170.1	P, G	None required	N/A	Analyze immediately
Dissolved oxygen	E360.1	G	None required	500 mL	Analyze immediately
Turbidity	E180.1	P, G	4°C	N/A	48 hours
Total organic carbon	SW9060	P, G, T	4°C, HCl or H_2SO_4 to pH < 2	500 mL	28 days
Chromium (VI)	SW7196A	P, G, T	4°C	500 mL or 8 ounces	24 hours (water); 30 days until extraction and 4 days after extraction (soil)
Mercury	SW7470A SW7471A	P, G, T	HNO_3 to pH < 2, 4°C	500 mL or 8 ounces	28 days (water and soil)
Metals (except chromium (VI) and mercury)	SW6010B and SW-846 AA methods	P, G, T	HNO_3 to pH < 2, 4°C	500 mL or 8 ounces	180 days (water and soil)

a. Polyethylene (P); glass (G); brass sleeves in the sample barrel, sometimes called California brass (T).

b. No pH adjustment for soil.

c. Preservation with 0.008 percent $Na_2S_2O_3$ is only required when residual chlorine is present.

Name	Analytical Methods	Container[a]	Preservation[b,c]	Minimum Sample Volume or Weight	Maximum Holding Time
Organochlorine pesticides	SW8081A	G, Teflon-lined cap, T	4°C	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Polychlorinated biphenyls (PCBs)	SW8082	G, Teflon-lined cap, T	4°C	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Semivolatile organics	SW8270C	G, Teflon-lined cap, T	4°C, 0.008% $Na_2S_2O_3$	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
Volatile organics	SW8260B	G, Teflon-lined septum, T	4°C, 0.008% $Na_2S_2O_3$ (HCl to pH < 2 for volatile aromatics)[b]	2 x 40 mL or 4 ounces	14 days (water and soil); 7 days if unpreserved by acid

a. Polyethylene (P); glass (G); brass sleeves in the sample barrel, sometimes called California brass (T).

b. No pH adjustment for soil.

c. Preservation with 0.008 percent $Na_2S_2O_3$ is only required when residual chlorine is present.

Name	Analytical Methods	Container[a]	Preservation[b,c]	Minimum Sample Volume or Weight	Maximum Holding Time
Polynuclear aromatic hydrocarbons (PAHs)	SW8310	G, Teflon-lined cap, T	4°C, store in dark, 0.008% $Na_2S_2O_3$	1 liter or 8 ounces	7 days until extraction and 40 days after extraction (water); 14 days until extraction and 40 days after extraction (soil)
TCLP	SW1311	G, Teflon-lined cap, T	Cool, 4°C	1 liter or 8 ounces	14 days to TCLP extraction and 14 days after extraction (volatiles); 14 days to TCLP extraction, 7 days to prep extraction and 40 days after prep extraction (semivolatiles); 28 days to TCLP extraction and 28 days after extraction (mercury); 180 days to TCLP extraction and 180 days after extraction (metals)

a. Polyethylene (P); glass (G); brass sleeves in the sample barrel, sometimes called California brass (T).

b. No pH adjustment for soil.

c. Preservation with 0.008 percent $Na_2S_2O_3$ is only required when residual chlorine is present.

SECTION 4.0

Field Screening Methods

Field screening methods for Kelly AFB include, but are not limited to, those methods presented in Table 4-1 below. Individual methods are addressed in the SAP. Calibration procedures, reporting limits and QC criteria for these methods are provided in Appendix A.

TABLE 4-1
Field Screening Parameters

Parameter	Method Number	Matrix[b]
Organic vapor	FID or PID	Air
Stream flow	N/A	SW
Iron II	Hach Method No. 8146	GW
Hydrogen, dissolved	Bubble Strip Method[a]	GW
Alkalinity	Hach Kit Model AL AP-MG	GW
Specific conductivity	SW9050A	GW, SW
Redox potential	ASTM D1498-93	GW
Dissolved oxygen (DO)	E360.1	GW, SW
PH	SW9040B	GW, SW
Turbidity	E180.1	GW, SW
Temperature	E170.1	GW, SW

Notes:
[a]Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (EPA, 1998)
[b]GW = groundwater, SW = surface water, SO = soil or sediment

If different or additional field methods/instruments are needed for a specific effort, they will be specified in the site-specific work plans. Standard operating procedures (SOP) or manufacturer's instructions will be part of the site-specific work plan.

4.1 Field Data Reporting

Field instruments used to collect temperature, pH, conductivity, DO, turbidity, and streamflow data are direct reading, making field calculations and subsequent data reduction unnecessary. All field data will be recorded in site logbooks on field data log sheets, or both, by appropriately trained field personnel (field technicians). Analytical data generated from the use of commercial test kits (i.e. alkalinity or ferrous iron) will also be recorded on field data sheets.

All data will be reviewed by the FTL, who is responsible for collecting and verifying all field data while in the field. Data initially will be accepted or rejected by the FTL before leaving the sampling site. Extreme readings (readings that appear significantly different from other readings at the same site) will be accepted only after the instrument has been checked for malfunction and the readings verified by re-testing.

Field documentation, sample data, instrument calibrations, and QC will be reviewed and validated by the PM or his designee before being included in the project files and/or reported to Kelly AFB. Quality control checks also will be reviewed by the PM who will be responsible for summarizing this data.

Should erroneous or missing data appear in the project documentation, the PM will crosscheck this information with the FTL. If the FTL or his project notes cannot verify the data, the PM must make a final decision as to the usability of the data in question. This decision will be based on discussions with the entire sampling team, knowledge of problems that were incurred during that particular sampling event, and review of collateral data (QC checks) that may indicate specific problems with field instrumentation. If the data cannot be verified, it will be flagged as rejected and not used.

The pH, temperature, conductivity, dissolved oxygen, and streamflow readings are recorded by the FTL and reviewed by the PM before being included in the project files in the raw form. Because these data are used as an indication of field conditions and well purging efficiency, there is no formal report generated to address these specific parameters.

Appropriate field data will also be provided to Kelly AFB as part of the electronic data deliverable as specified in Section 6.3**.**

SECTION 5.0

Definitive Analytical Methods

The typical laboratory analytical procedures to be used on the Kelly AFB project are identified in Table 5-1 and are described in detail in Appendix A. (Appendix B also contains this information with Compliance Plan comparison.) Appendix A contains target analyte lists, reporting limits, QC procedures and acceptance criteria. When methods are required that are not addressed in this document, the SAP will include descriptions of the method and QC parameters in the same level of detail as the methods listed in this document.

TABLE 5-1
Kelly AFB Definitive Analytical Methods

Analyte Group	Parameter	Method Number	Matrix (a)
Organics			
	Volatile compounds	SW8260B	S, W
	Semi-volatile compounds	SW8270C	S, W
	PAHs by HPLC	SW8310	S, W
	PCBs	SW8082	S, W
	Chlorinated pesticides	SW8081A	S, W
Metals			
	Metals	SW6010B/7000 (b)	S, W
	Cyanide	SW9010B/9012A	S, W
Natural Attenuation/General Chemistry			
	Nitrate/nitrite	SW9056	W
	Sulfate	SW9056	W
	Methane/ethane/ethene	RSK-175	W
	TOC	SW9060	S, W
	Hardness (as CaCO3)	E130.2	W
	Total dissolved solids (residue, filterable)	E160.1	W
	Sulfate (as SO4)	SW9056	W
	Alkalinity, total (as CaCO3)	E310.1	W
	Nitrogen, ammonia (as N)	E350.2	W
	Dissolved oxygen	E360.1	W
	Phosphorus, dissolved orthophosphate (as P)	E365.2	W
	Phosphorus, total orthophosphate (as P)	E365.2	W

Analyte Group	Parameter	Method Number	Matrix (a)
	Phosphorus, dissolved (as P)	E365.3	W
	Biologic oxygen demand, 5 day	E405.1	W
	COD – chemical oxygen demand	E410.4	W
	Oil & grease, total recoverable	E413.1	W
	Methylene blue active substances	E425.1	W
	TPH	TX1005(c) and E418.1	S, W

Notes:
(a) SPLP extraction may be required for VOCs, SVOCs, PAH, Pest/PCBs and metals
(b) See the target analyte list in Appendix A for a list of metals by method
(c) TNRCC method required for UST removal projects
(d) The specified analyte list and reporting limits for water samples are listed in Table 1 and Table 1A of the *Kelly AFB Compliance Plan No. CP-50310 dated June 12, 1998*.

Prior to field sample collection, the project chemist will prepare a set of laboratory project instructions. These instructions will address the following:

- Field sampling schedule
- Method, analyte and reporting limit requirements by matrix
- Descriptions of QA/QC parameters by method
- Lines of communication
- Data package deliverables
- Analytical turn-around time
- Corrective actions

5.1 Data Reporting Requirements

Before the field effort begins, the analytical laboratory should provide copies of the their method detection limit (MDL) study results to the project chemist. The MDL study results will be used to identify laboratory-specific practical quantitation limits (PQL), which are equal to or less than program-specific reporting limits summarized in Appendix A. The PQL is the concentration of the target compound or analyte that the laboratory has demonstrated the ability to measure accurately and reproducibly, a minimum of 2 times the MDL. The laboratory will be required to submit the results of its MDL studies during the laboratory approval phase. MDLs are calculated using the method described in 40 CFR 136.

Samples results for organic, inorganic and general chemistry parameters will be reported to the project specific reporting limits given in Appendix A. Sample results less than the program-specific reporting limit but greater than the calculated MDL will be reported as estimated with a ***J*** laboratory qualifier. Other data qualifiers may be used by the laboratory to indicate diluted sample results, the presence of blank contamination etc. Acceptable laboratory data qualifiers are presented in Appendix A. In the event the subcontracted laboratory uses qualification flags other than those given in Appendix A, definitions of all laboratory-specific qualifiers used must be provided as part of the data package deliverable.

Specific projects may require the laboratory to report tentatively identified compounds (TICs) for GC/MS Volatiles and Semivolatiles. Chromatographic peaks in volatile or

semivolatile fraction analyses that are not target analytes, system-monitoring compounds, or internal standards are potential tentatively identified compounds (TICs). TICs must be qualitatively identified via a forward search of the NIST/EPA/NIH and/or Wiley Mass Spectral Library, and the identifications assessed by the data reviewer.

For each sample, the laboratory must conduct a mass spectral search using the most recent version of the NIST library. The laboratory will report the possible identity for the appropriate number (10 from volatile fraction and 20 from semivolatile fraction) of the largest peaks which have area or height greater than 10 percent of the area or height of the nearest internal standard . System monitoring compounds, internal standards, or target compounds should not be reported as TICs. TIC results are reported for each sample on the Organic Analyses Data Sheet (Form 1,TIC or equivalent). In addition the laboratory will supply the mass spectra of the unknown compound and the three best mass spectral matches as determined by the software library comparison routine.

The analytical sample turn-around time is defined as the amount of time (in days) from sample collection to receipt by the PM of the required and complete data package. The standard turn-around time for environmental sample will be 21 calendar days. Shorter turn-around times may be required for some projects and will be established as necessary in the project specific SAP.

5.2 Data Package Deliverables

In general, definitive data package deliverables should contain the information found on applicable example reporting forms provided in *Contract Laboratory Program's Inorganic Statement of Work ILM 04.0* and *Organic Statement of Work OLM 03.2* (EPA, 1994). The hardcopy data package requirements are summarized by analytical fraction in Table 5-2 below. In cases where dilutions, re-extractions and/or re-analysis of samples are performed, the laboratory will report all associated results. The electronic data package deliverable format is described in Section 6.3.

TABLE 5-2
Data Package Deliverables: Definitive Data

Method	Description	Form Name
Common to All Methods		
	Holding time information and requested methods	Signed Chain-of-Custody and Request for Analysis forms
	Sample condition upon receipt	Laboratory sample receipt form
	Discussion of laboratory analysis, including any laboratory problems	Laboratory case narratives
	Discussion of any laboratory corrective actions taken	Copy of the associated laboratory corrective action form(s)
	Definitions of all laboratory data qualifiers	Table of laboratory data qualification flags

Method	Description	Form Name
	QC sample/analysis control limits or acceptance criteria	QC summary forms specified for each analytical parameter must list QC control limits or acceptance criteria for the method performed
Organics - Gas Chromatography/mass Spectrometry (GC/MS) analysis		
	GC/MS	
	Sample and Field QC [, including tentatively identified compounds] (if required)	Contract Laboratory Program (CLP) Form 1or equivalent
	Surrogate recoveries	CLP Form 2 or equivalent
	MS/MSD or LCS results	CLP Form 3 or equivalent
	Method blank summary	CLP Form 4or equivalent
	GC/MS tuning (instrument performance check)	CLP Form 5 or equivalent
	GC/MS initial calibration data	CLP Form 6 or equivalent (concentration of calibration standards must be listed)
	GC/MS continuing calibration data	CLP Form 7 or equivalent
	GC/MS internal standard (IS) area and retention time summary	CLP Form 8 or equivalent
	QC check sample results (if required by method)	Report QC check sample true value, measured concentration, and percent recovery (%R)
	Compound reporting limit	Method detection limit study results
Organics - GC Chromatography Analysis		
	Sample and QC (i.e., laboratory blanks) results	CLP Form 1 or equivalent
	Surrogate recoveries	CLP Form 2 or equivalent
	MS/MSD or LCS results	CLP Form 3 or equivalent
	Method blank summary	CLP Form 4 or equivalent
	Initial calibration data for single component analytes	CLP Forms 6D & 6E or equivalent (if IS calibration is used, report response factors on Form 6E) must be provided for primary and confirmation columns
	Initial calibration data for multi-component analytes	CLP Form 6F or equivalent must be provided for primary and confirmation columns
	QC check sample results (if required by method)	Report QC check sample true value, measured concentration, and %R
	Calibration verification summary	CLP Form 7 or equivalent
	Analytical sequence	CLP Form 8 or equivalent

Method	Description	Form Name
	Florisil cartridge check (if required)	CLP Form 9A or equivalent
	Gel Permeation Chromatography calibration (if required)	CLP Form 9B or equivalent
	Compound identification summary (provides evidence of second-column confirmation	CLP Form 10A or equivalent (single component). CLP Form 10B or Equivalent (multi-component analytes)
	Compound reporting limit	Method detection limit study results
Metals Analysis		
	Sample results	CLP Form 1 or equivalent
	Initial and continuing calibration	CLP Form 2 or equivalent
	Blank results (includes method blank, initial calibration blank, continuing calibration blank)	CLP Form 3 or equivalent
	Inductively coupled plasma (ICP) interference check samples	CLP Form 4 or equivalent
	Spike sample recovery	CLP Form 5A or equivalent
	Post-digest spike sample recovery for ICP	CLP Form 5B or equivalent
	Sample duplicate results	CLP Form 6 or equivalent
	LCS results	CLP Form 7 or equivalent
	Standard addition results (if required)	CLP Form 8 or equivalent
	ICP serial dilutions	CLP Form 9 or equivalent
	Instrument detection limits	CLP Form 10 or equivalent
	ICP interelement correction factors	CLP Forms 11A and 11B or equivalent
	ICP linear ranges	CLP Form 12 or equivalent
	Sample preparation log	CLP Form 13 or equivalent
	Analytical run log	CLP Form 14 or equivalent (concentrations of calibration standards must be listed for graphite furnace atomic absorption, cold vapor atomic absorption, and cyanide analysis)
General Chemistry Parameters		
	Sample results	Report results - no format
	Method blank results (one/batch)	Report results and provide correlations between blanks and samples
	Calibration (initial and continuing)	Calibration standard concentrations and responses for initial and continuing (if required) calibrations

Method	Description	Form Name
	MS and/or sample duplicate results	Report %Rec (MS) or relative percent differences (RPDs) (duplicates)
	LCS results	Report result, %R, and true value
	Standard addition results (if required)	Report concentrations and responses for initial sample and all standard additions
	Sample preparation log	Sample preparation information, including initial and final weights and volumes

SECTION 6.0

Data Reporting, Review, and Validation

6.1 Field Screening Data

In general, field-screening data will not be subject to additional review beyond that described in Section 4.1 Field Data Reporting. However, in some instances the PM may direct the project chemist to review screening results to provide additional information on data usability.

6.2 Definitive Data

The project chemists will perform validation of definitive data. The purpose of this review is to assess the quality of the analytical data and to evaluate its usability to support project decision making. The data will be compared with the project DQOs and a PARCC evaluation will be performed.

Sample results will be validated using the approach presented in the AFCEE QAPP, and when not covered by the document, *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 1994) and the *U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1994), modified for current SW846 method requirements. Method-specific QC acceptance criteria and validation guidance are provided in Appendix A and are derived from the SW-846, with modifications as required for historical comparisons. For cases where these documents do not provide all of the necessary guidance, the project chemist's professional judgment (with knowledge of the methods and the site history) will be utilized. The data qualifying flag definitions are provided in Table 6-1 and differ from AFCEE flags in order to be consistent with historical data.

TABLE 6-1
Data Qualifier Flag Definitions

J	Analyte was present but reported value may not be accurate or precise.
R	This result has been rejected as unusable.
U	This analyte was analyzed for but not detected at the specified detection limit.
UJ	The analyte was not detected above the reported detection limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

The data review and validation process is independent of the laboratory's checks. This process focuses on the usability of the data to support the project data interpretation and decision-making process. Examples of areas of review include data package completeness,

holding time compliance, initial and continuing calibration, spiked sample results, method blank results, and duplicate sample results. A data review worksheet will be completed for each data package.

Laboratory qualifying flags are included on the data summary forms (CLP Form 1, AFCEE Form 2 or equivalent) submitted to the project by the laboratory. However, during the data review and validation process, the laboratory qualifying flags are evaluated and replaced with validation flags.

Once each of the data packages has been reviewed and the data review worksheets completed, the entire data set will be evaluated for overall trends in data quality and usability. The results of the data validation will be summarized in a data quality evaluation (DQE) report and submitted to the PM for inclusion in the final project deliverables to Kelly AFB. The DQE will address the following:

- Analyte frequencies of detection
- Target analyte occurrence in QC samples
- Surrogate spike recoveries
- Matrix spike/matrix spike duplicate results
- Laboratory control sample results
- Instrument tuning and calibration problems
- Non-target analyte occurrences in field samples
- Unusual occurrences effecting data quality/usability
- PARCCs

6.3 Electronic Data Reports

The prime contractor will provide an electronic deliverable report in the Environmental Restoration Program Information Management System (ERPIMS) format as specified by the SOW for each Kelly AFB project.

ERPIMS is a data management system designed to accommodate all types of data collected for IRP projects. Specific codes and data forms have been developed to allow consistent and efficient input of information to the system. The ERPIMS information will be provided to Kelly AFB via ASCII files in specified ERPIMS format on 3.5-inch floppy diskettes. The information transferred will include all required technical data such as site information; well characteristics; and hydrogeologic, geologic, physical, and chemical analysis results. Electronic data reporting formats and requirements are given in the most current version of the ERPIMS Data Loading Handbook.

6.4 Archiving

Hardcopy and electronic versions will be archived in project files and on electronic archive tapes for the duration of the project or a minimum of 5 years, whichever is longer.

6.5 Data Flow and Transfer

The data flow from the laboratory and field to the project staff and data users will be sufficiently documented to ensure that data are properly tracked, reviewed, and validated for use.

6.6 Recordkeeping

The laboratory will maintain electronic and hardcopy records sufficient to recreate each analytical event associated with a given Kelly AFB project. The minimum records the laboratory will keep contain the following:

- Records containing information defined in Table 5-2.
- Raw data, including instrument printouts, bench work sheets, and/or chromatograms with compound identification and quantitation reports
- Laboratory-specific written SOPs for each analytical method and QA/QC function in place at the time of analysis of project samples

SECTION 7.0

Performance and System Audits

7.1 Systems Audits

Program monitoring by QA to verify compliance with the requirements established for Kelly AFB will consist of a comprehensive system of planned, periodic audit, and surveillance activities. All QA audits and surveillance will be performed by or under the supervision of a QA manager. These activities will include coverage of a reasonable cross section of active work to ensure that the project documents and all applicable procedural requirements are properly implemented.

Field audits of selected sites may be performed during site activities to verify that project quality requirements are met. Field audits will provide a review of all pertinent field activities, such as:

- Equipment decontamination
- Specific field procedure methods, such as drilling and sampling
- Field documentation
- Field measurements
- Sample collection/documentation (COC)
- Sample packing/shipping

External audits of contractor operations by contractor, client, or regulatory agencies may be performed at the discretion of the external organization. Contractor personnel will assist in all external audits of field and office activities.

7.2 Laboratory Performance Audits

The analytical laboratory will conduct both internal and external QC checks. External QC checks include participation in EPA and other certification and performance evaluation programs. The results of quarterly performance evaluation samples will be made available to the PM upon request. Internal QC checks (duplicates, blanks, and spiked samples) will be performed in accordance with the approved methods.

Laboratory systems will be audited annually and as required by specific projects. Contracted laboratories are required to submit a laboratory QAPP and relevant SOPs before the field effort begins. If any problems are noted during data evaluation and data use, specific corrective actions will be implemented on a case-by-case basis. The project chemist or PM may request an additional system audit, if warranted.

Depending on the project objectives, the laboratory may be required to perform the following:

- Monthly project review of 10 percent of all projects done by the QA department

- Audits performed by the laboratory QA manager at a frequency greater than specified in the laboratory-specific QAPP

The project chemist or corporate management may require special audits when a problem is suspected.

SECTION 8.0

Corrective Action

Corrective actions include problem identification, assignment of investigation responsibility, investigation, action to eliminate the problem, increased monitoring of the effectiveness of the corrective action, and verification that the problem has been eliminated.

Documentation of the problem is important to the overall management of the study. A Corrective Action Request Form for the person discovering the QA problem will complete problems associated with sample collection (Appendix C). This form identifies the problem, establishes possible causes, and designates the person responsible for action. The responsible person will be either the PM or the FTL.

The Corrective Action Request Form includes a description of the corrective action planned and has space for follow-up. The PM will verify that initial action has been taken and appears to be effective and, at an appropriate later date, will check to see if the problem has been resolved. The PM receives a copy of all Corrective Action Request Forms and enters them into the Corrective Action Log. This permanent record will aid the PM in following up and will assist in resolving QA problems.

Laboratory corrective action reports must be forwarded to the project chemist within 24 hours of the initiation. In some cases, the laboratory must gain concurrence of the project chemist before implementing Corrective Actions that may effect the analytical data usability. Examples of corrective actions include, but are not limited to:

- Correcting COC forms
- Re-analyzing field samples (if holding time criteria permit)
- Re-calibrating with freshly prepared standards
- Training of laboratory personnel in special sample preparation and analysis techniques
- Reassignment of analytical responsibilities
- Recommending an audit of laboratory procedures.

Additional approaches may include:

- Re-sampling and re-analysis
- Evaluating and amending sampling and analytical procedures
- Accepting the data and acknowledging the level of uncertainty or inaccuracy by flagging the validated data and providing an explanation for the qualifications

SECTION 9.0

Preventive Maintenance

9.1 Field Maintenance

The field personnel operating the field equipment and appropriate offsite laboratory chemists are responsible for maintaining their respective instruments as detailed in the field sampling plan (Table 9-1). Preventive maintenance will be scheduled to minimize downtime and the potential interruption of analytical work. All equipment used will be maintained in accordance with the manufacturer's instructions. Routine maintenance and all equipment repairs will be documented in the site logbook. If any equipment fails to operate properly, the instrument either will be repaired in-house (if possible) or will be sent out for repairs and another instrument equivalent to the original substituted (if possible).

TABLE 9-1
Field Equipment Preventive Maintenance

Instrument	Activity	Frequency
Conductivity/temperature meter	Battery replacement Probe cleaning	As needed (indicated by LCD display) As needed
DO meter	Battery replacement Membrane replacement	As needed (indicated by LCD display) As needed
ORP meter	Battery replacement	As needed
pH meter	Electrode cleaning	As needed (indicated by LCD display) As needed
Turbidity meter	Battery replacement Bulb change	As needed As needed
Streamflow meter	Battery replacement Probe cleaning	As needed (indicated by LCD display) As needed

9.2 Laboratory Maintenance

Designated laboratory personnel will be trained in routine maintenance procedures for all major instrumentation. Either trained staff or trained service engineers/technicians employed by the instrument manufacturer will make repairs. The laboratory will have multiple instruments that will serve as backup to minimize potential downtime. All maintenance will be documented and kept in permanent logs. These logs will be available for review by auditing personnel. Preventive maintenance for laboratory instruments will be discussed in detail in the laboratory-specific QAPP.

SECTION 10.0

Quality Assurance Reports

The purpose of QA reports is to document implementation of the QAPP. These reports include periodic assessments of measurement data accuracy, precision, and completeness of the results of performance audits, the results of system audits, and identification of significant QA problems and recommended solutions. The analytical laboratory will be responsible for submitting monthly progress reports to the client, as requested.

After comments from the client and regulatory agencies have been incorporated, the final QA report, attached as an appendix to the project report, will be submitted to the client. The final QA report may include the following:

- Data quality assessment in terms of precision, accuracy, representativeness, completeness and comparability, and method detection limits
- The degree to which DQOs were met
- Limitations of the measurement data, usability of the data
- Applicability of the data to site conditions
- Laboratory QC activities, including a summary of planned versus actual laboratory QC activities, explanations for deviations, and an evaluation of data quality for each analysis for each media
- Field QC activities, including a summary of planned versus actual field QC activities, explanations for deviations, and evaluations of the data quality of field QC samples/activities and estimated effect on sample data
- Data presentation and evaluation, including an assessment of sampling and analysis techniques, data quality for each analysis and each media, and data usability

SECTION 11.0

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Appendix A
Tables

Appendix A: List of Tables

A-1 Summary of Extraction, Digestion and Preparatory Methods

TABLE A-1.a
Extraction and Digestion Procedures

SW846 Method	Sample Preparation
1311	Toxicity Characteristic Leaching Procedure
1312	Synthetic Precipitation Leaching Procedure
3005A	Acid Digestion of Water Samples for Metals Analysis
3010A	Acid Digestion of Aqueous Samples and Extracts for Metals Analysis
3015	Microwave Assisted Acid Digestion of Aqueous Samples and Extracts for Metals Analysis
3020A	Acid Digestion of Aqueous Samples and Extracts for Metals Analysis
3050B	Acid Digestion of Solids, Sediments, and Sludges for Metals Analysis
3051	Microwave Assisted Acid Digestion of Solids, Sediments, and Sludges for Metals Analysis
3060A	Alkaline Digestion for Hexavalent Chromium
3510C	Separatory Funnel Liquid-Liquid Extraction
3520C	Continuous Liquid-Liquid Extraction
3535	Solid-Phase Extraction
3540C/3541	Soxhlet Extraction
3545	Pressurized Fluid Extraction
3550B	Ultrasonic Extraction
5021	Volatile Organic Compounds in Soils and Other Solid Matrices Using Equilibrium Headspace Analysis
5030B	Purge and Trap
5035	Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples

TABLE A-1.b
Analytical Methods and Associated Preparatory Methods

Analytical Method	Parameter	Preparatory Methods
8011	Ethylene dibromide (EDB) (water)	8011, 5030B
8015 (modified)	TPH volatile and extractable (water and soil)	(volatiles) 5030B, , 5035 (extractables) 3510C, 3520C, 3541, 3550B
8021B	Aromatic and halogenated volatile organics (water and soil)	5021, 5030B, 5035
8070A	Nitrosamines (water and soil)	3510C, 3520C, 3540C, 3541, 3550B
8081A	Organochlorine pesticides (water and soil)	3510C, 3520C, 3540C, 3541, 3550B
8082	PCBs (water and soil)	3510C, 3520C, 3540C, 3541
8141A	Organophosphorus compounds (water and soil)	3510C, 3520C, 3540C, 3541, 3550B
8151A	Chlorinated herbicides (water and soil)	3510C, 3520C, 3540C, 3541, 3550B
8260B	Volatile organics (water and soil)	5021, 5030B, 5035
8270C	Semivolatile organics (water and soil)	3510C, 3520C, 3540C, 3541, , 3550B
8280A/8290	Dioxins and furans (water and soil)	(see method)
8310	Polynuclear aromatic hydrocarbons (PAHs) (water and soil)	3510C, 3520C, 3540C, 3541, 3550B
8330	Explosive residues (water and soil)	3510C, 3520C, 3540C, 3541, 3550B
6010B	Trace metals by ICPES (water and soil)	3005A, 3010A, 3015, 3050B, 3051
6020	Trace metals by ICP-MS (water and soil)	3005A, 3010A, 3015, 3050B, 3051
7041	Antimony (water and soil)	(see method), 3005A
7060A	Arsenic (water and soil)	(see method), 3050B
7131A	Cadmium (water and soil)	3015, 3020A, 3050B, 3051
7191	Chromium (water and soil)	3015, 3020A, 3050B, 3051
7196A	Hexavalent chromium	3060A
7421	Lead (water and soil)	3015, 3020A, 3050B, 3051
7470A	Mercury (water)	(see method)
7471A	Mercury (soil)	(see method)
7521	Nickel (water and soil)	3015, 3020A, 3050B, 3051
7740	Selenium (water and soil)	(see method), 3050B
7841	Thallium (water and soil)	3015, 3020A, 3050B, 3051
7911	Vanadium (water and soil)	3015, 3020A, 3050B, 3051
9010B	Cyanide (water)	(see method)

Analytical Method	Parameter	Preparatory Methods
9012A	Cyanide (water)	(see method)
9056	Common anions	N/A
TX 1005	TNRCC method for total petroleum hydrocarbons(	(see method)

TABLE A-1.b.2
EPA-Defined Organic and Inorganic Laboratory Data Qualifiers

Organic Laboratory Data Qualifiers:

U This flag indicates the compound was analyzed for but not detected.

J This flag indicates an estimated value.

N This flag indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds (TICs), where the identification is based on a mass spectral library search. It is applied to all TIC results. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N flag is not used.

P This flag is used for a pesticide/Aroclor target analyte when there is greater than method or project difference for detected concentrations between the two GC columns.

C This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B This flag is used when the analyte is found in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user to take appropriate action. This flag shall be used for a tentatively identified compound as well as for a positively identified target compound. The combination of flags BU or UB is expressly prohibited. Blank contaminants are flagged B only when they are detected in the sample.

E This flag identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument for that specific analysis. If one or more compounds have a response greater than the upper level of the calibration range, the sample or extract shall be diluted and reanalyzed according to the project requirements. All such compounds with a response greater than the upper level of the calibration range shall have the concentration flagged with an E on Form I for the original analysis.

D If a sample or extract is reanalyzed at a higher dilution factor, for example when the concentration of an analyte exceeds the upper calibration range, the DL suffix is appended to the sample number on Form I for the more diluted sample, and all reported concentrations on that Form I are flagged with the D flag. This flag alerts data users that any discrepancies between the reported concentrations may be due to dilution of the sample or extract.

A: This flag indicates that a tentatively identified compound is a suspected aldol-condensation product.

X: Other specific flags may be required to properly define the results. If used, the flags shall be fully described, with the description attached to the sample data summary package and the SDG Narrative. Begin by using X. If more than one flag is required, use Y and Z as needed. If more than five
qualifiers are required for a sample result, use the X flag to represent a combination of several flags. For instance, the X flag might combine the A, B, and D flags for some samples. The laboratory-defined flags are limited to X, Y, and Z.

Inorganic Laboratory Data Qualifiers

For inorganics, under the columns labeled "C," "Q," and "M," enter result qualifiers as identified below. If additional qualifiers are used, their explicit definitions shall be included on the Cover Page in the Comments section.

C (Concentration) qualifier

Enter "B" if the reported value was obtained from a reading that was less than the reporting limit but greater than or equal to the Instrument Detection Limit (IDL) or method detection limit (MDL) – as required by the project. If the analyte was analyzed for but not detected, IDL/MDL "U" shall be entered.

Q qualifier

Specified entries and their meanings are as follows:

E- The reported value is estimated because of the presence of interference associated with the serial dilution. An explanatory note shall be included under Comments on the Cover Page (if the problem applies to all samples) or on the specific FORM I-IN (if it is an isolated problem).

M – GFAA duplicate injection precision not met.

N - Spiked sample recovery not within control limits.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance. (See Exhibit E.)

* - Duplicate analysis not within control limits.

+ - Correlation coefficient for the MSA is less than 0.995.

Entering "S," "W," or "+" is mutually exclusive. No combination of these qualifiers can appear in the same field for an analyte.

M (Method) qualifier

"P"	for ICP
"A"	for Flame AA
"F"	for Furnace AA
"PM"	for ICP when Microwave Digestion is used
"AM"	for flame AA when Microwave Digestion is used
"FM"	for Furnace AA when Microwave Digestion is used
"CV"	for Manual Cold Vapor AA
"AV"	for Automated Cold Vapor AA
"CA"	for Midi-Distillation Spectrophotometric
"AS"	for Semi-Automated Spectrophotometric
"C"	for Manual Spectrophotometric
"T"	for Titrimetric
" "	where no data have been entered
"NR"	if the analyte is not required to be analyzed.

Appendix A-1
Tables

Appendix A-2
Tables

Appendix B
Tables

TABLE B-1
Kelly AFB Definitive Analytical Methods

Analyte Group	Parameter	Method Number	Matrix (a)	Specified CP Constituent
Organics				
	Volatile compounds	SW8260B	S, W	Yes
	Semi-volatile compounds	SW8270C	S, W	Yes
	PAHs by HPLC	SW8310	S, W	
	PCBs	SW8082	S, W	Yes
	Chlorinated pesticides	SW8081A	S, W	Yes
Metals				
	Metals	SW6010B/7000 (b)	S, W	Yes
	Cyanide	SW9010B/9012A	S, W	Yes
Natural Attenuation/General Chemistry				
	Nitrate/nitrite	SW9056	W	No
	Sulfate	SW9056	W	No
	Methane/ethane/ethene	RSK-175	W	No
	TOC	SW9060	S, W	No
	Hardness (as CaCO3)	E130.2	W	No
	Total dissolved solids (residue, filterable)	E160.1	W	No
	Sulfate (as SO4)	SW9056	W	No
	Alkalinity, total (as CaCO3)	E310.1	W	No
	Nitrogen, ammonia (as N)	E350.2	W	No
	Dissolved oxygen	E360.1	W	No
	Phosphorus, dissolved orthophosphate (as P)	E365.2	W	No
	Phosphorus, total orthophosphate (as P)	E365.2	W	No
	Phosphorus, dissolved (as P)	E365.3	W	No
	Biologic oxygen demand, 5 day	E405.1	W	No
	COD – chemical oxygen demand	E410.4	W	No
	Oil & grease, total recoverable	E413.1	W	No
	Methylene blue active substances	E425.1	W	No
	TPH	TX1005(c) and E418.1	S, W	No

TABLE B-2
RLs for Method SW8081A

Parameter/Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit	CP
Organochlorine	α-BHC	0.0135	µg/L	1.7	µg/kg	0.0135
Pesticides	β-BHC	0.05	µg/L	1.7	µg/kg	0.473
SW8081A	δ-BHC	0.05	µg/L	1.7	µg/kg	NL
	γ-BHC (Lindane)	0.05	µg/L	1.7	µg/kg	0.2
	α-Chlordane	0.05	µg/L	1.7	µg/kg	0.2
	γ-Chlordane	0.05	µg/L	1.7	µg/kg	0.2
	4,4'-DDD	0.1	µg/L	3.3	µg/kg	0.355
	4,4'-DDE	0.1	µg/L	3.3	µg/kg	0.25
	4,4'-DDT	0.1	µg/L	3.3	µg/kg	0.25
	Aldrin	0.05	µg/L	1.7	µg/kg	NL
	Dieldrin	0.00532	µg/L	3.3	µg/kg	0.00532
	Endosulfan I	0.05	µg/L	1.7	µg/kg	NL
	Endosulfan II	0.1	µg/L	3.3	µg/kg	NL
	Endosulfan Sulfate	0.1	µg/L	3.3	µg/kg	NL
	Endrin	0.1	µg/L	3.3	µg/kg	NL
	Endrin Aldehyde	0.1	µg/L	3.3	µg/kg	NL
	Endrin Ketone	0.1	µg/L	3.3	µg/kg	NL
	Heptachlor	0.05	µg/L	1.7	µg/kg	0.4
	Heptachlor Epoxide	0.05	µg/L	1.7	µg/kg	0.2
	Methoxychlor	0.5	µg/L	17	µg/kg	NL
	Toxaphene	3	µg/L	170	µg/kg	3

TABLE B-3
RLs for Method SW8082

Parameter/		Water		Soil		CP
Method	**Analyte**	**RL**	**Unit**	**RL**	**Unit**	**Concentration Limits**
PCB	PCB-1016	0.5	µg/L	33	µg/L	NL
	PCB-1221	0.5	µg/L	67	µg/L	NL
	PCB-1232	0.5	µg/L	33	µg/L	0.5
	PCB-1242	0.5	µg/L	33	µg/L	NL
	PCB-1248	0.5	µg/L	33	µg/L	0.5
	PCB-1254	0.5	µg/L	33	µg/L	0.5
	PCB-1260	0.5	µg/L	33	µg/L	0.5

TABLE B-4
RLs for Method SW8260B

Parameter/ Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit	CP Concentration Limits
VOCs	Chloromethane	1	µg/L	10	µg/kg	NL
SW8260B	Bromomethane	1	µg/L	10	µg/kg	NL
	Vinyl Chloride	1	µg/L	10	µg/kg	2
	Chloroethane	1	µg/L	10	µg/kg	730
	Methylene Chloride	2	µg/L	5	µg/kg	5
	Acetone	5	µg/L	10	µg/kg	3650
	Carbon Disulfide	1	µg/L	5	µg/kg	3650
	1,1-Dichloroethene	1	µg/L	5	µg/kg	7
	1,1-Dichloroethane	1	µg/L	5	µg/kg	3650
	1,2-Dichloroethene (Total)	1	µg/L	5	µg/kg	70
	Cis- 1,2- Dichloroethane	1	µg/L	5	µg/kg	NL
	Trans- 1,2-Dichloroethene	1	µg/L	5	µg/kg	NL
	Chloroform	1	µg/L	5	µg/kg	100
	1,2- Dichloroethane	1	µg/L	5	µg/kg	NL
	2-Butanone	5	µg/L	10	µg/kg	1830
	1,1,1-Trichloroethane	1	µg/L	5	µg/kg	200
	Carbon tetrachloride	1	µg/L	5	µg/kg	5
	Vinyl Acetate	5	µg/L	10	µg/kg	36500
	Bromodichloromethane	1	µg/L	5	µg/kg	NL
	1,2- Dischloropropane	1	µg/L	5	µg/kg	5
	Cis- 1,3- Dichloropropene	1	µg/L	5	µg/kg	NL
	Trichloroehtene	1	µg/L	5	µg/kg	5
	Dibromochloromethane	1	µg/L	5	µg/kg	NL
	1, 1,2- Trichloroethane	1	µg/L	5	µg/kg	5
	Benzene	1	µg/L	5	µg/kg	5
	Trans- 1,3- Dichloropene	1	µg/L	5	µg/kg	NL
	Bromoform	1	µg/L	5	µg/kg	NL
	2-Hexanone	5	µg/L	10	µg/kg	50
	4-Methyl-2-pentanone	5	µg/L	10	µg/kg	1830

TABLE B-4
RLs for Method SW8260B

Parameter/ Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit	CP Concentration Limits
	Tetrachloroethene	1	µg/L	5		5
	1, 1,2,2- Tetrachloroethane	1	µg/L	5		NL
	Toluene	1	µg/L	5		1000
	Chlorobenzene	1	µg/L	5		100
	Ethylbenzene	1	µg/L	5		700
	Styrene	1	µg/L	5		100
	Xylenes (Total)	1	µg/L	5		10000

TABLE B-5
RLs for Method SW8270C

Parameter/Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit	CP Concentration Limits
Semivolatile organics	1,2,4-Trichlorobenzene	10.0	µg/L	330	µg/kg	70
Base/Neutral Extractables	1,2-Dichlorobenzene	10.0	µg/L	330	µg/kg	600
SW8270C	1,3-Dichlorobenzene	10.0	µg/L	330	µg/kg	600
	1,4-Dichlorobenzene	10.0	µg/L	330	µg/kg	75
	2,4-Dinitrotoluene	10.0	µg/L	330	µg/kg	NL
	2,6-Dinitrotoluene	10.0	µg/L	330	µg/kg	NL
	2-Chloronaphthalene	10.0	µg/L	330	µg/kg	NL
	2-Methylnaphthalene	10.0	µg/L	330	µg/kg	10
	2-Nitroaniline	25.0	µg/L	830	µg/kg	NL
Semivolatile organics	3-Nitroaniline	25.0	µg/L	830	µg/kg	NL
Base/Neutral Extractables	3,3'-Dichlorobenzidine	10.0	µg/L	330	µg/kg	20
SW8270C	4-Bromophenyl phenyl ether	10.0	µg/L	330	µg/kg	NL
(continued)	4-Chloroaniline	10.0	µg/L	330	µg/kg	NL
	4-Nitroaniline	25.0	µg/L	830	µg/kg	NL
	Acenaphthylene	10.0	µg/L	330	µg/kg	2190
	Acenapthene	10.0	µg/L	330	µg/kg	NL
	Anthracene	10.0	µg/L	330	µg/kg	11000
	Benz (a) anthracene	10.0	µg/L	330	µg/kg	NL
	Benzo (a) pyrene	10.0	µg/L	330	µg/kg	200
	Benzo (b) fluoranthene	10.0	µg/L	330	µg/kg	NL
	Benzo (k) fluoranthene	10.0	µg/L	330	µg/kg	NL
	Benzo (g,h,i) perylene	10.0	µg/L	330	µg/kg	NL
	Bis (2-chloroethoxy) methane	10.0	µg/L	330	µg/kg	NL
	Bis (2-chlorethyl) ether	10.0	µg/L	330	µg/kg	NL
	4-chlorophenyl phenyl ether	10.0	µg/L	330	µg/kg	NL
	Bis (2-ethylhexyl) phthalate	10.0	µg/L	330	µg/kg	6
	Butyl benzylphthalate	6.0	µg/L	330	µg/kg	5
	Carbazole	10.0	µg/L	330	µg/kg	NL
	Chrysene	10.0	µg/L	330	µg/kg	10
	Di-n-butylphthalate	10.0	µg/L	330	µg/kg	NL
	Di-n-octylphthalate	10.0	µg/L	330	µg/kg	NL
	Dibenz (a,h) anthracene	10.0	µg/L	330	µg/kg	NL
	Dibenzofuran	10.0	µg/L	330	µg/kg	10
	Diethyl phthalate	10.0	µg/L	330	µg/kg	29200
	Dimethly phthalate	10.0	µg/L	330	µg/kg	NL
	Fluoranthene	10.0	µg/L	330	µg/kg	1460
	Fluorene	10.0	µg/L	330	µg/kg	1460
	Hexachlorobenzene	10.0	µg/L	330	µg/kg	NL
	Hexachlorobutadiene	10.0	µg/L	330	µg/kg	NL
	Hexachlorocyclopentadiene	10.0	µg/L	330	µg/kg	NL

TABLE B-5
RLs for Method SW8270C

Parameter/Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit	CP Concentration Limits
	Hexachloroethane	10.0	µg/L	330	µg/kg	61
	Indeno (1,2,3-cd) pyrene	10.0	µg/L	330	µg/kg	NL
	Isophorone	10.0	µg/L	330	µg/kg	NL
	n-Nitrosodiphenylamine	10.0	µg/L	330	µg/kg	NL
	n-Nitrosodi-n-propylamine	10.0	µg/L	330	µg/kg	10
	Naphthalene	10.0	µg/L	330	µg/kg	1460
	Nitrobenzene	10.0	µg/L	330	µg/kg	NL
	Phenanthrene	10.0	µg/L	330	µg/kg	10
Semivolatile organics	Pyrene	10.0	µg/L	330	µg/kg	1100
	2,2'-oxybis(1-chloroprpane)	10.0	µg/L	330	µg/kg	NL
Acid Extractables	2,4,5-Trichlorophenol	25.0	µg/L	830	µg/kg	NL
SW8270C	2,4,6-Trichlorophenol	10.0	µg/L	330	µg/kg	NL
(Continued)	2,4-Dichlorophenol	10.0	µg/L	330	µg/kg	110
	2,4-Dimethylphenol	10.0	µg/L	330	µg/kg	730
	2,4-Dinitrophenol	25.0	µg/L	830	µg/kg	NL
	2-Chlorophenol	10.0	µg/L	330	µg/kg	NL
	2-Methylphenol	10.0	µg/L	330	µg/kg	1830
	2-Nitrophenol	10.0	µg/L	330	µg/kg	10
	4-Nitrophenol	10.0	µg/L	330	µg/kg	10
	4,6-Dinitro-2-methylphenol	25.0	µg/L	830	µg/kg	NL
	4-Chloro-3-methylphenol	10.0	µg/L	330	µg/kg	NL
	4-Methylphenol	10.0	µg/L	330	µg/kg	1830
	Pentachlorophenol	10.0	µg/L	330	µg/kg	1
	Phenol	10.0	µg/L	330	µg/kg	21900

TABLE B-6
RLs for Method SW8310

Parameter/ Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit	CP Concentration Limits
Polynuclear Aromatic	Acenaphthene	18.0	µg/L	1.2	mg/kg	2190
Hydrocarbons	Acenaphthylene	23.0	µg/L	1.54	mg/kg	NL
SW8310	Anthracene	6.6	µg/L	0.44	mg/kg	11000
	Benzo (a) anthracene	0.13	µg/L	0.009	mg/kg	NL
	Benzo (a) pyrene	0.2	µg/L	0.015	mg/kg	200
	Benzo (b) fluoranthene	0.18	µg/L	0.012	mg/kg	NL
	Benzo (g,h,i) perylene	0.76	µg/L	0.05	mg/kg	NL
	Benzo (k) fluoranthene	0.17	µg/L	0.011	mg/kg	NL
	Chrysene	1.5	µg/L	0.1	mg/kg	10
	Dibenzo (a,h) anthracene	0.3	µg/L	0.02	mg/kg	NL
	Fluoranthrene	2.1	µg/L	0.14	mg/kg	1460
	Fluorene	2.1	µg/L	0.14	mg/kg	1460
	Indeno (1,2,3-c,d) pyrene	0.43	µg/L	0.03	mg/kg	NL
	Naphthalene	18.0	µg/L	1.2	mg/kg	1460
	Phenanthrene	6.4	µg/L	0.42	mg/kg	10
	Pyrene	2.7	µg/L	0.18	mg/kg	1100